

## REMARKS

This paper is being presented in response to the final official action dated April 10, 2006, wherein: (a) claims 1, 2, 4, and 6-9 were pending; (b) claims 1, 4, and 6-9 were rejected under 35 USC § 103(a) as being obvious over Meador et al., *193-nm Multilayer Imaging Systems* (Proc. SPIE vol. 5039, June 12, 2003) ("Meador") in view of Mizutani et al. U.S. Patent No. 6,506,535 ("Mizutani"); and, (c) claim 2 was rejected over Meador in view of Shibata et al., *Material and Process Development of Tri-level Resist System in KrF and ArF Lithography* (Proc. SPIE vol. 4690, 2002) ("Shibata"). Reconsideration and withdrawal of the rejections are respectfully requested in view of the foregoing amendments and following remarks.

This paper is timely filed as it is accompanied by a petition under 37 CFR § 1.136(a) for an extension of time to file in the 1<sup>st</sup> month, and payment of the required extension fee.

### **I. Brief Summary of the Amendments to the Claims**

Claims 1, 2, and 9 have been amended for clarity.

Claim 4 has been amended to depend properly from claim 1.

New claims 11-13 have been added, and recite the same subject matter recited in claims 2, 4, and 8, respectively.

No new matter has been introduced by these amendments.

### **II. Applicant Interview Summary**

On August 1, 2006, Examiner Patricia George and Primary Examiner Nadine Norton conducted an telephonic interview with the undersigned attorney James Zeller and attorney Steven Parks.

A draft of this paper was provided to Examiner George in advance of the interview and was the subject of the interview. The differences between this paper and the draft discussed during the interview include: (1) the inclusion of the interview summary, (2) the further clarifying amendment of claim 1 to recite "silicon gas" instead of "gas" in step (b), (3) the clarifying amendment to claim 2, (4) the amendment of claim 4 to correct the claim dependency, and (5) the addition of new claims 11-13 depending from claim 9 and reciting the same subject matter recited in claims 2, 4, and 8, respectively.

During the interview, claims 1, 6, and 9 were discussed. The references discussed included Meador and Mizutani.

The following agreement was reached during the interview: (1) claim 9 would be allowable in its present form, (2) claims 1-8 would receive further consideration based on the arguments presented, and (3) subsequent consideration of claims 1-8 would not result in a final official action if a rejection is issued.

### **III. The 35 USC § 103(a) Rejections Are Traversed**

Claims 1, 4, and 6-9 were rejected under 35 USC § 103(a) as being obvious over Meador in view of Mizutani. Claim 2 was rejected under 35 USC § 103(a) as being obvious over Meador in view of Shibata. *See* p. 2-5 of the action.

#### **A. Proper Basis for a § 103(a) Rejection**

To establish a *prima facie* case of obviousness, the PTO must satisfy three basic criteria. First, the combined disclosure of the prior art references must teach or suggest all of the claim limitations. Second, there must be some suggestion or motivation to modify or combine the teachings in the art to make the precise combination recited in the claims. Finally, a person having ordinary skill in the art must have a reasonable expectation of success when combining or modifying the disclosures of the references. The suggestion or motivation to make the claimed invention and the reasonable expectation of success must both be derived from the prior art, and not from the application's disclosure. *See* MPEP §§ 2142-43 (8th ed., October 2005).

#### **B. Meador and Mizutani do not Render Claims 1; 4, and 6-9 Obvious**

Meador and Mizutani **do not** teach or suggest all of the limitations recited in claims 1, 4, and 6-9. Thus, no *prima facie* case of obviousness exists based on these publications.

Specifically, neither Meador nor Mizutani discloses a gas protection film formed on a photoresist layer, and Mizutani's resist composition suffers (but does not remedy) the corresponding problem that a silicon gas is generated during an exposure process.

Meador is directed to a multilayer microlithography system. Meador discloses only three lithographic layers on a substrate: (1) a bottom antireflective coating ("BARC") applied directly to the substrate, (2) an etching mask layer ("EML"; also

termed the “middle layer”) applied to the BARC layer, and (3) a photoresist layer applied to the EML. *See* Meador, at abstract, § 3.1.6, and Fig. 1. The EML is applied as a solution containing PGMEA as a solvent for its undisclosed polymeric ingredient. *See* Meador, at § 3.1.1. The undisclosed polymeric ingredient of the EML contains silicon. *See* Meador, at § 3.1.1 and Table 1. The BARC layer is applied as a solution containing PGMEA/PGME/PnP as a solvent for its undisclosed polymeric ingredient. *See* Meador, at § 3.2 and § 3.2.1.

Mizutani is directed to a photoresist composition. A disclosed embodiment of the composition includes a *terpolymer* of a silicon-containing cyclic olefin monomer, a dicarboxylate monomer, and a methyl acrylate monomer. *See* Mizutani, col. 108, line 38 to col. 109, line 34 (showing the three repeating units of Resin (1) and Resin (2), both of which contain methyl acrylate monomer units). In two examples using Resin (1) and Resin (2), PGMEA was used as a solvent. *See* Mizutani, col. 111, Table I-2. Mizutani’s photoresist is the only disclosed structure that is applied to a silicon wafer prior to exposure to an ArF laser. *See, e.g.*, Mizutani, col. 110, lines 54-64.

#### **1. Gas Protection Film**

Steps (a), (b), and (c) of claim 1 recite four structural elements: (1) an underlying layer, (2) an etching mask layer, (3) a photoresist film, and (4) a gas protection film. As recited in step (c), the gas protection film is coated on the photoresist film.

In the layered structure disclosed by Meador, the photoresist layer is the outermost layer of the multilayer microlithography system. *See* Meador, at Fig. 1. Meador discloses no additional structure formed onto its photoresist layer, and therefore has no structure corresponding to the gas protection film recited in claim 1.

Mizutani is only directed to the chemical composition of a photoresist layer and does not remedy Meador’s deficiency by suggesting the formation of an additional gas protection film on its silicon-containing (and, therefore, silicon-releasing) photoresist layer.

For this reason alone, claim 1 (and all claims depending therefrom) should be allowed.

## **2. Water-Soluble Polymer and Absorption of Silicon Gas**

Step (c) of claim 1 recites that the gas protection film comprises a water-soluble polymer that absorbs silicon gas generated from the photoresist film.

Meador does not disclose, nor does it provide any reason to infer, that the polymeric materials used in its multilayer microlithography system are both water-soluble and able to absorb silicon gas generated from its photoresist layer.

Mizutani does not remedy this deficiency because it provides no indication that its disclosed photoresist resins are water-soluble and able to absorb silicon gas. Further, the action provides no reasoning why such properties might be expected from the photoresist resins of Mizutani. *See* p. 4 of the action.

For this reasons alone, claim 1 (and all claims depending therefrom) should be allowed.

## **3. Particular Water-Soluble Polymer Species**

Claims 6 and 9 recite particular water-soluble polymer species including, for example, the copolymers poly(methyl acrylate/acrylic acid) and poly(dimethyl acrylate/methyl acrylate).

As noted above in Section III.B, Meador does not disclose any particular polymer species.

As noted above in Section III.B, Mizutani discloses a terpolymer of a silicon-containing cyclic olefin monomer, a dicarboxylate monomer, and a methyl acrylate monomer. A terpolymer containing methyl acrylate repeating units is not the same as a copolymer of methyl acrylate and either acrylic acid or dimethyl acrylate repeating units.

Thus, even if combined, Meador and Mizutani fail to disclose any of the particular water-soluble polymers recited in claims 6 and 9. For this reason, claims 6 and 9 may be allowed.

### **C. Meador and Shibata do not Render Claim 2 Obvious**

Meador and Shibata **do not** teach or suggest all of the limitations recited in claim 2. Thus, no *prima facie* case of obviousness exists based on these publications.

Meador is discussed in Section III.B, above.

Shibata is directed to a tri-level resist lithography system. The action cites Shibata for the disclosure of a KrF resist. *See* p. 5 of the action.

However, Shibata does not remedy the deficiencies of Meador with respect to the gas protection film recited in claim 1. *See* Sections III.B.1 and III.B.2, above. For each of these reasons, claim 2 should be allowed.

#### **IV. Conclusion**

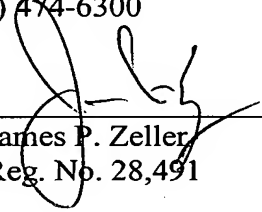
In view of the foregoing, entry of the amendments to claims 1 and 9, reconsideration and withdrawal of the rejections, and allowance of all pending claims 1, 2, 4, and 6-9 are respectfully requested.

Should the examiner wish to discuss the foregoing or any matter of form in an effort to advance this application towards allowance, he is urged to telephone the undersigned at the indicated number.

Respectfully submitted,

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